Please find below and/or attached an Office communication concerning this application or proceeding.

	Application No.	Applicant(s)
Office Action Summary	10/039,309	SATO ET AL.
	Examiner	Art Unit
	Johannes P Mondt	2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _02 July 2004_.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1 and 3-9_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1 and 3-9_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☒ All   b)☐ Some * c)☐ None of:

       1.☒ Certified copies of the priority documents have been received.

       2.☐ Certified copies of the priority documents have been received in Application No. _____.

       3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

DETAILED ACTION

Response to Amendment

Response filed July 2, 2004 forms the basis of this official action. Comments on Remarks in said Response are included below under "Response to Arguments".

Response to Arguments

1.   Applicant's arguments filed July 2, 2004, have been fully considered but they are not fully persuasive. In particular, although Example 1 in Takiguchi et al clearly teaches an intrinsic pitch (at least approximately) twice as large as a thickness of a liquid crystal layer, - to which col. 3, lines 41-44 in Takiguchi et al evidently refer, Example 2 in Takiguchi et al gives an account on the manufacture of a device similar to the one in Example 1 except that the thickness of the liquid crystal layer ("d") is 3.5 μm and the helical pitch has the value P = 1.8 μm while their preferred range for d / P includes 0.8 (cf. col. 4, l. 30-42). Admittedly, the actual teaching of a preferential range by Takeguchi et al concerns the range up to d / P = 0.8 (col. 4, l. 30-42), which does not overlap the claimed range 1 < d / P < 15. However, Applicant's disclosure does not demonstrate the criticality of the difference between d / P = 0.8 and a value of d / P that is only infinitesimally greater than 1. The statement in said disclosure (Specification, pages 24-25) is conditional on the unclaimed vertical alignment layers and not supported with any data for the range 0.8 < d / P < 1. Parenthetically, the juxtaposition of Examples 1 and 2 by Takiguchi et al only serves to show that d / P = 2 is better than d / P = 0.51, which is

irrelevant for estimating the difference between the performance with d / P =0.8 and d /

P = 1. Therefore, Takeguchi et al cannot be said to teach away from the invention as

claimed.

Furthermore, it has come to the examiner's attention through further searching

that the range as claimed overlaps a long-recognized range for the ratio d / P of crystal

layer thickness d divided by helical pitch P for nematic liquid crystal layers with variable

layer thickness (as in Kahn et al, the primary reference in the previous official action), as

evidenced by Nakamura et al (5,576,860), namely 1.5 < P < 4 (cf. col. 5, l. 1-15).

Applicant is reminded again that it has been held that a *prima facie* case of obviousness

typically exists when the range overlaps the range disclosed in the prior art or when the

ranges of a claimed composition do not overlap but are close enough such that one

skilled in the art would have expected them to have the same properties. In re Peterson,

65 USPQ2d 1379 (CA FC 2003). To provide the best art to date possible the present

action must therefore utilize Nakamura et al and is for this reason made non-final.

Claim Rejections - 35 USC § 103

1.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1.   ***Claims 1, 6, 8 and 9*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Khan et al (6,377,321) in view of Okada et al (JP406102485A) and Nakamura et al (5,576,860). Khan et al teach a liquid crystal layer 22 (cf. col. 10, l. 42-47); a pair of substrates, e.g., 12 and 14 (cf. col. 10, l. 34-53), so as to interpose the liquid crystal layer there between, and a plurality of pixels arranged in matrix pattern (inherently so when the electrode configuration is in matrix pattern) (cf. col. 11, l. 5-19), wherein: the liquid crystal layer "has a helical structure" in the sense as disclosed by Applicant, i.e., has molecules with helical symmetry in it (cf. col. 9, l. 53 – col. 11, l. 3) (N.B.: inherently, cholesteric molecules have helical axes) and exhibits at least two stable states including a planar state and a focal conic state according to an applied voltage (cf. col. 15, l. 36-51).

        Khan et al do not necessarily teach a thickness d in each of the plurality of pixels to have to different values and the liquid crystal layer to include at least two regions having different values of a first threshold voltage for transitioning from the planar to the focal conic state.

        However, the provision of thickness gradients within the liquid crystal layer so as to achieve a first threshold voltage difference for two regions within said liquid crystal layer would have been obvious in view of *Okada et al*, who teach said thickness to have a gradient in the liquid crystal layer, and thus have at least two different values (in fact all values between d1 and d2), as a means to achieve a gradient in the threshold voltage (cf. English abstract, "Constitution" and Figures 7 and 8(a)), and hence at least two different values in said threshold voltage.

Motivation to include the teaching by Okada et al into the invention by Khan et al

stems from the desirability to avoid display instability, as explained by Okada et al (cf.

English abstract, "Purpose"), while unstable displays are generically disadvantageous in

the art of liquid crystal displays. *Combination* of said teaching with said invention is

straightforward: the liquid crystal display by Khan et al also relies on helical molecules,

being of the chiral nematic liquid crystal variety (cf. abstract), while variation, in

particular the inclusion of a thickness gradient is easily achieved over the spatial extent

of a cell. *Success* in implementing the combination can therefore be reasonably

expected.

Neither Khan et al nor Okada necessarily teach the further limitation "wherein the

thickness d of the liquid crystal layer satisfies a relationship of $1<d/P<15$ with a helical

pitch P of the helical structure". However, it would have been obvious to include said

further limitation in view of Nakamura et al, who, in a patent on a liquid crystal display

based on a nematic liquid crystal with helical pitch (cf. col. 3, l. 3-23), hence closely

related to the nematic liquid crystal device by Khan et al (cf. abstract and cols. 5 and 6),

that the ratio of the liquid crystal layer (numeral 7 in Figure 5) thickness d divided by the

helical pitch P, for the purpose of achieving high contrast and hence bright display,

preferentially is to be in the range $1.5 < d/P < 4$ (cf. col. 3, l. 10-45). Overlapping range

at least implies a *prima facie* case of obviousness; cf. for instance In re Peterson, 65

USPQ2d 1379 (CA FC 2003).

Motivation to combine the teaching by Nakamura et al in this regard with the

invention at least derives from the statement by Nakamura et al on the accomplishment

of achieving a high contrast and thus a bright display (cf. col. 5, l. 1-3) which is a generic

advantage for liquid crystal displays.

On claim 6: in Okada et al the value of the thickness changes continuously

across the pixels (cf. Figure 8a).

On claim 8: the upper surface of the lowest of the two substrates in Figure 7,

hence the one closer to the liquid crystal layer than the other side of said substrate by

Okada et al is concave as a whole.

On claim 9: the top surface of the bottom substrate in Figure 7 is concave, while

the bottom surface of the top substrate in Figure 7 is both concave and convex

according to the second definition of convex cited from Merriam-Webster (see rejection

under 35 U.S.C. 112 of claim 8 given above).

2.   ***Claim 3*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Khan et

al, Okada et al and Nakamura et al as applied to claim 1 above, and further in view of

Masazumi (6,414,669). As detailed above, claim 1 is unpatentable over Khan et al in

view of Okada et al and Nakamura et al. Neither Khan et al nor Okada et al nor

Nakamura et al necessarily teach the further limitation as defined by claim 3. However,

it would have been obvious to define the thickness d in the manner as defined by claim

3 in view of Masazumi, who teaches in the analogous art of liquid crystal display

devices with cholesteric phase (cf. col. 1, title and abstract) that the said first threshold

voltage ("Vth2" in Masazumi, cf. col. 2, l. 1-23) for transitioning from the planar state to

the focal conic state (cf. abstract and loc. cit.) is less than the second threshold voltage

("Vth1" and V1 in Masazumi, loc. cit.) (cf. Fig. 37).

Motivation to adhere to the teaching by Masazumi in this regard for the entire

range of thicknesses is not to upset the driving method: if the condition that forms the

basis of this claim were not met then for some portions of the pixel the homeotropic

state would be achieved while other portions would remain in the focal conic state,

which cannot be the intention of any liquid crystal device. Combination of the teaching

by Masazumi in this regard in the invention by Khan et al, Okada et al and Nakamura et

al is readily achieved by proper bracketing of the thicknesses in the liquid crystal layer.

Success in implementing the combination can therefore be reasonably expected.

2.   ***Claims 4-5*** are rejected under 35 U.S.C. 103(a) as being unpatentable over

Khan et al, Okada and Nakamura et al as applied to claim 1 above, and further in view

of Ogawa et al (4,632,514). Although neither Khan et al nor Okada nor Nakamura et al

necessarily teach the further limitation as defined by claim 4, it would have been

obvious to include said further limitation in view of Ogawa et al, who, in a patent drawn

to a multi-color liquid crystal display, teach variation of the thickness of the liquid crystal

layer such that different abutting substantially flat or horizontal regions in a pixel

electrode have different liquid crystal layer thickness for different color picture elements

(cf. abstract and col. 3, I. 60-65) thus providing a staircase pattern (cf. abstract and

Figures 15-16). Note that thickness increase is effected by a succession of a plurality of

substantially flat or substantially horizontal regions (cf. Figures 15 1-6) and that in

Figures 15-16 and 21-22 said thickness increases from the center to each end of the liquid crystal display.

Motivation to include the teaching by Ogawa et al in this regard is the minimization of optical rotatory dispersion thus improving quality of display (cf. abstract). On claim 5: the further limitation of claim 5 is met by the teaching by Ogawa et al for the differences in thicknesses for the three basic colors, the minimum crystal layer thickness difference between two colors being 0.6 μm (cf. col. 14, l. 5-29). Therefore, the quantity Δd minimally equals 0.6 μm, which when implemented in the invention by Khan et al as described above meets the claim, P being 0.36 μm. It is furthermore noted that the inequality that forms the essence of this claim hinges exclusively on a ratio $(P/(2\Delta d)$ that is a result-effective variable, depending on the desired portion of the electromagnetic spectrum (see, for instance, Ogawa et al, col. 17, l. 60-70, from which it follows that P is a function of the spectral domain, while we already have seen that Δd is as well) requiring only standard experimental skills and hence must be regarded as a design choice.

3.   **Claim 7** is rejected under 35 U.S.C. 103(a) as being unpatentable over Khan et al, Okada et al and Nakamura et al as applied to claim 1 above, and further in view of Scherer et al (5,880,801). As detailed above, claim 1 is unpatentable over Kahn et al, Okada et al and Nakamura et al, none of whom necessarily teach the further limitation of claim 7.

However, it would have been obvious to include said further limitation in view of Scherer et al, who teach top and bottom substrates 42 and 44, respectively (cf. col. 4, l. 20-60) to be aligned horizontally and vertically, respectively, so as to achieve hybrid-aligned cells by which an electro-optic response is achieved at low voltage compared with a device with pure homogeneous alignment (cf. col. 3, l. 29-47).

3.   *Motivation* to include the teaching by Scherer into the invention by Khan et al, Okada et al and Nakamura et al in this regard stems from the desirability to achieve response at low voltage (Scherer, loc.cit). Combination of said teaching and said invention is straightforward through the process to make HAN crystal cells as disclosed by Scherer et al (cf. col. 3, l. 7-47). Success in implementing said combination can therefore be reasonably expected.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P Mondt whose telephone number is 571-272-1919. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

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you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free).

JPM
September 11, 2004

Patent Examiner:

Johannes Mondt
Art Unit: 2826